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Using MODIS Data: Surveying Users and Potential Users at IGARSS 2002

by Steve Kempler

At the recent IEEE International Geoscience and Remote Sensing Symposium (IGARSS) Conference in Toronto (June 24–28, 2002) I talked with visitors to the GES DAAC outreach booth for the purpose of qualifying and quantifying their experiences with accessing and receiving MODIS Earth science data products. My findings were a little different from what I expected.

Background

It has been generally expected that, based on the large amount of MODIS data being generated and archived, distribution would be wide and far, especially now, after collecting data for over 2 years. In December 2000, after less than a year of MODIS data processing, a MODIS data user survey performed at the AGU Conference provided the following results.

1. *Data Maturity*—Several people indicated that they would wait for a more mature data product because of their resource limitations.

2. *Data Access*—Several people had experienced difficulties with ordering data and have not tried again.

3. *Data Subsetting (spatial, temporal, and parameter)*—The transfer of large data files is difficult. Several users would find the data more manageable if vertical profiles of selected parameters for specified geographical regions were available.

4. *Data Formats*—Some users expressed concern about the data being available only in HDF-EOS format.

Since this survey, all issues were addressed and, to varying degrees, resolved as follows:

1. reprocessing of MODIS data to a validated state

2. enhancements to the EDG and GES DAAC (aka WHOM) interface so that it is easier to order the data

3. development and operation of data reduction services (e.g., subsetting, subsampling, etc.)

4. development and operation of tools for putting data in other, more popular formats.

Also, the **GES DAAC Data Order to Delivery** study team made several significant findings that were immediately implemented, greatly increasing the system reliability for ordering and receiving MODIS data.

As a result of these efforts, distribution of MODIS data continues to increase and be more reliable, with very large volume orders cautiously filled for fear of reaching the EOSDIS Core System (ECS) distribution threshold. Some of the larger data volume users have developed methods for acquiring needed data by throttling their orders over time, so as not to saturate ECS distribution. Although the GES DAAC does not discourage users from using these tools to acquire needed data, usage should be coordinated with the GES DAAC to ensure that aggregate thresholds are still not too high to handle.

Still, distribution lags behind expectations.

IGARSS Findings

At our IGARSS booth, I spoke casually with approximately 50 users of remote sensing data. My planned sequence of questions through conversation was as follows:

1. Are you aware of the many MODIS Earth science products that are available?
2. If the products are of interest to you, and you have not ordered any, what stopped you or why did you decide not to?
   a. Were technical problems the issue?

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   b. What should data providers do so that you can acquire the desired MODIS data more easily?
   c. What are your plans to continue your research or work, given your experience attempting to get MODIS data?
3. What would make data access better in the future?
4. What is your area of research?

As you can see, I was oriented toward understanding data order and access issues. My planned discussions were somewhat altered by the responses I received from this particular sampling. The responses of the remote sensing data users I spoke with fall into the following categories.

A—those who know nothing about MODIS data or their availability. Their return questions included, What is it? Is it available? Is it free? (Or, "It's free!") Most people became very interested in MODIS data once they knew about it, especially the **free** part (~24%).

B—those who have not used MODIS data but see the improvements over older remote sensing data and plan to use them in the future. These users are typically in the middle of an existing project, don't wish to spend time learning a different data set at this time, are waiting for the opportunity (i.e., new proposal funding), wish to continue to use data sets they're familiar with, or require the use of other types of data (e.g., Radar, Microwave, others). Two people tried ordering data, but decided not to when they realized the relative complexities of the data sets, and that it was not the right time to indulge (~32%).

C—those who work with higher resolution data than MODIS offers or require real time data, thus have not tried to access MODIS data. In discussion, though, four users realized the value of MODIS data to supplement their work or have come to realize the significance of Direct Broadcast (~18%).

D—those who are very satisfied with their acquisition of MODIS data. When pressed if they encountered any of the "known" issues, they indicated that they took the time to learn the ordering interface, took the time to understand HDF (and appreciate its richness), and prepared accordingly for the voluminous nature of the data. (But they will still begin using the new data subsetting tools). These users are characterized as routine users receiving 20 MB to 50 MB of data per access, and very knowledgeable about the data and data access as indicated by the advanced technical questions they asked (~22%).

E—those who expressed some kind of dissatisfaction, including HDF being too complex to use and reprojecting MODIS data being a problem (~4%).

Another comment from an otherwise happy user is that surface reflectance is very useful, but land classification is not.

Conclusions

Based on the discussions I had with representatives of the IGARSS 2002 community, primarily research scientists, to a lesser degree application researchers and remote sensing technologists, I conclude that

1. MODIS data are being accessed at a healthy pace by small data volume users who access what they need to focus on. This is consistent with MODIS data distribution from the GES DAAC seeing low but steady data access.

2. MODIS data are relatively unknown outside the Investigators Working Group (IWG) extended community.

3. A natural lag exists between the availability of a new data set and users preparing to use (i.e., proposing to use) the data set. As MODIS data come on line we should not expect great numbers of users to suddenly move away from using existing, favorite, and well-understood data sets in favor of MODIS data until opportunity to do so arises. It should be noted that TRMM data distribution saw a marked increase approximately 20 months after TRMM launch. This could be because of the same phenomenon, but further study is needed to know for sure. Note, also, that the relative size of this group implies that new MODIS users must be given knowledge and direct access to newly developed tools that facilitate data access and distribution.

4. Related to this, even when given tutorials about MODIS data and MODIS data access, potential users will not access MODIS data until the incentive exists.

5. In this conference, Poster Papers that included the use of MODIS data were composed of highly technical or scientific research. This is consistent with interviews that found current MODIS data users to be very knowledgeable while nonusers knew little about MODIS. The people I talked with at this meeting were not representative of the expected large number of MODIS data users. It would be interesting to determine the usage of MODIS data in less technical forums.

6. Furthermore, continued and necessary outreach to the IGARSS type of community will no doubt continue to grow the usage of MODIS data, but the real test for mass applications usage will be the results of outreach in less technical communities where outreach needs to be better organized if NASA is serious about moving into this market.

SeaWiFS – the Little Mission That Could… andDid… (and Still Is)

A Slightly Personal Evaluation of the Past 5 Years of SeaWiFS Ocean Color Measurements

by James Acker

I didn't watch the launch 5 years ago.

My track record for live launch watching wasn't that great. (Unfortunately I forgot about that last year, and watched the QuikTOMS/Orbview–4 launch, and they didn't reach orbit. That's the last one I'll watch live for awhile.) So when everyone else went into the conference room to watch the SeaWiFS launch, I stayed in my cubicle. But I watched the updates, and when the "in orbit" message had been received I watched the replay. There's always a few seconds of trepidation with a Pegasus launch (even when you're watching the replay of one you know was successful) between the drop and ignition when you wonder if they have a parachute that could deploy if the engine doesn't light. But it did. No parachute necessary.

Of course, my job was somewhat riding on that Pegasus. I'd been with the DAAC's Ocean Color Data Support Team for less than a year, and we didn't really have a reason for existence if SeaWiFS didn't launch. Of course, the winter before I wasn't even sure if I would still be with NASA, given the government shutdown uncertainty. But beyond my personal prospects, what was riding on the launch was the future of an entire branch of marine science devoted to the study of ocean optics and remotely sensed ocean color, with all of its biological, phenomenological, and sedimentological aspects. This community had been waiting a long time for SeaWiFS—so long, in fact, that Japan's Ocean Color and Temperature Sensor (OCTS) launched about a year before. And when OCTS went dark with MIDORI, its parent satellite, there was even more riding on a successful SeaWiFS launch.

As we all know (since I'm writing this), SeaWiFS reached orbit, ascended to a higher orbit (that sounds so spiritual, but the satellite has to be at the correct altitude to have the correct pixel size), and then began Earth observations. The first data were received September 4, 1997. The first full day of operation was September 18, 1997. And the first data were available to users on September 23, 1997. Three months after that, with the first data reprocessing, the first "science quality" data were ready for the research community.

And what did SeaWiFS see in those first eventful months?

- A blaze of bright turquoise-green in the Bering Sea, signifying an immense coccolithophore bloom of unprecedented proportions in that region
- A patch of productivity north of Hawaii whose existence had been suspected, but never fully quantified
- The nearly complete disappearance of the Pacific Equatorial Upwelling, suppressed by the intense El Niño event—SeaWiFS would watch, and wait, and then capture the wavelike surges of productivity as the Pacific Equatorial Upwelling flashed back into existence in July 1998.

Milestones abound.

- The entire Coastal Zone Color Scanner (CZCS) mission of 8 years was required to capture a single complete view of the oceanic biosphere (and even then there were a few small remaining gaps)—SeaWiFS accomplished that in the **first 2 weeks** of the mission's observational phase
- The first quantification of GLOBAL carbon cycling (not just ocean or land) and the difference in the annual carbon flux in El Niño and non-El Niño years
- The most accurate quantification of global chlorophyll concentrations ever achieved to date
- Stunningly accurate chlorophyll retrievals corresponding to shipboard measurements during the Joint Global Ocean Flux Study (JGOFS) Southern Ocean Process Study
- The first basinwide observations of the North Atlantic Spring Bloom (spring 1998 and every subsequent spring).

And those are just a few highlights. What really strikes me is what has been accomplished by a mission in which the satellite is actually owned and controlled by someone else: in this case, Orbimage Inc. Back in the years of the Reagan Administration, there was a call for "privatization" and the commercialization of space. The SeaWiFS Project was conceived in this era, and it has accomplished all that it has accomplished as a unique partnership between the public and private sectors. NASA provides the science, tunes the algorithms, watches over the instrument calibration (more on that below), and advises Orbimage on the commanding of the satellite to observe places of interest; Orbimage commands the satellite, monitors its functioning, wakes it up occasionally when it goes into "safe haven" mode or when it is shut down for a passing swarm of meteors, and also sells the data to improve the efficiency of commercial fishing op-

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erations. (Orbimage Inc. should be commended for sticking with SeaWiFS in the face of some uncertainty as to whether this "data buy" mission plan would really work.)

Add to this the fact that by waiting a few years for launch, the instrument was significantly improved, most notably with a two-level gain that allows land observations as well as ocean observations. This function has made SeaWiFS a preeminent Earth observer, and SeaWiFS images have turned up in many different places and for many different phenomena, even on local TV weather reports. Hurricanes, floods, fires, plumes of sediment, brilliant parallel blooms of different phytoplankton species, red tides, black water, dust storms, atmospheric vortex wakes, volcanic eruptions, the hazy pall of pollution—SeaWiFS observed them all.

One notable element of the SeaWiFS Project that might be forgotten is that SeaWiFS occasionally gets moonstruck. Every month, SeaWiFS "flips over" to moon gaze, either a few days before or after full moon. The moon's radiance acts as a constant calibration standard, so that the radiometric response of all eight SeaWiFS bands has been monitored and accurately characterized for the entire mission. This ongoing calibration program means that the data are always being generated according to known instrument operating parameters. That's one of the reasons the data are so accurate.

But there's another reason. The SeaWiFS Project has led the research community in the adoption of standard ocean optical methods, which (hopefully) means that if you are an ocean optical scientist on a United States research vessel in the Bering Sea, or on a British vessel just north of the Falkland Islands, or a Japanese ship in the Kuroshio Current, you will be performing optical measurements and chlorophyll measurements in the exact same way. Why is that important? Because if the data taken in the water aren't accurate, then there is no way that the data from the satellite can be made more accurate by comparison to such "sea truth" data.

And let's not forget MOBY, the Marine Optical Buoy, moored off Lanai, Hawaii, most* of the time. MOBY provides data that can be directly compared to SeaWiFS or MODIS data every time they look at MOBY, which is called a "matchup" comparison. MOBY is an important element in the synergistic partnership between the SeaWiFS Project and the MODIS Project, specifically the MODIS Ocean Team.

By the way, the ocean optics program even determined that the standard calibration lamps used to calibrate ocean optical instrumentation aren't nearly as standard as they were thought to be. Every element of the observational program has been examined to make SeaWiFS data and the data from subsequent ocean color instruments more accurate. (You can read all about this in the SeaWiFS Technical Memorandum Series, of course. The volumes in the TM Pre- and Post-launch series document, in painstaking detail, describe virtually every aspect of the SeaWiFS Project.)

And then there's SeaDAS, the SeaWiFS Data Analysis System. Imagine having the SeaWiFS Project in your PC. Well, stop imagining—that's what SeaDAS does! The same processing software that generates the SeaWiFS Project standard products (and a few others) is completely duplicated in SeaDAS, so that users anywhere can process the data in the exact same way as the SeaWiFS Project. The original motivation for SeaDAS was that ground station operators needed to have the capability to process their high-resolution data in the same way as the SeaWiFS Project does. So SeaDAS allows ground station operators and researchers around the world to perform all of these processing functions. And this provides an opportunity for these researchers to adjust data processing for their own region, perhaps because of different atmospheric conditions or different optical characteristics in the water they study. That allows researchers to obtain even more accurate data for the region they study than can be obtained with the "global" algorithms used by the SeaWiFS Project. Originally developed for a different reason, SeaDAS provides ocean color researchers remarkable analytical flexibility.

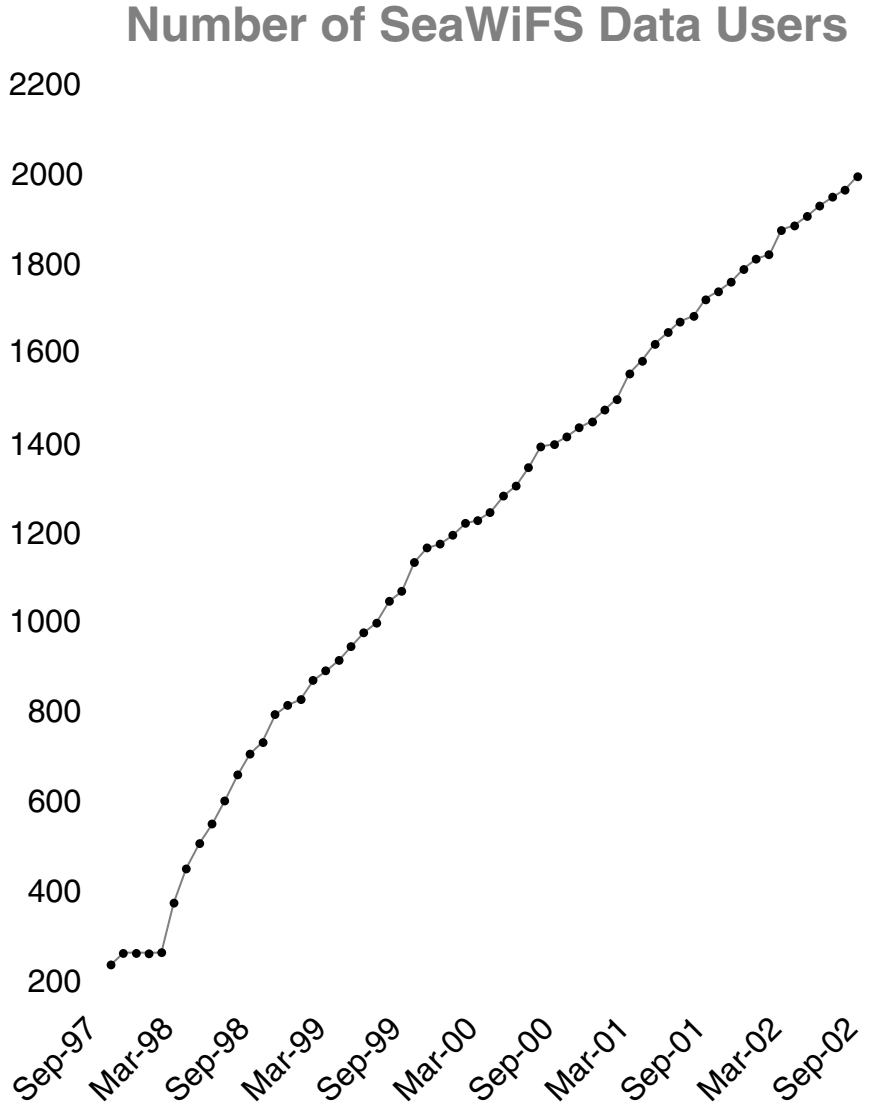
And I would be remiss if I didn't mention SIMBIOS (an acronym far easier to remember then the full name of the project, which is "Sensor Intercomparison and Merger for Biological and Interdisciplinary Ocean Studies"). SIMBIOS is responsible for coordinating the comparison of ocean color data from different satellite ocean color instruments, starting with SeaWiFS, MODIS–Terra, and MODIS–Aqua; also Japan's OCTS and GLI, the MISR instrument on Terra, the European POLDER instruments on ADEOS–I (MIDORI) and ADEOS–II, and the MOS instrument on the Indian IRIS–P3 satellite. Other satellite missions have participated in SIMBIOS activities, too. SIMBIOS is vital to many oceangoing scientists as well, because it is through SIMBIOS that fresh SeaWiFS images can be sent to research vessels at sea to aid cruise planning and "features of interest" detection. Adding to the SIMBIOS plethora is the SIMBIOS Science Team, which conducts ocean color verification studies on cruises in various bodies of water. SIMBIOS is also the site that holds the SeaBASS (SeaWiFS Bio-Optical Archive and Storage System) repository of data that can be used to develop and improve ocean color algorithms. And SIMBIOS even has a "pool" of ocean optical instruments that researchers can request for cruises. And there's more...but that's enough to show you the role played by SIMBIOS.

** "Most" is when it's anchored to the bottom. MOBY's anchor line has occasionally been severed, necessitating a high speed, high stakes chase to retrieve the wayward buoy.*

One minor aspect of the partnership between SeaWiFS and Orbimage has been the requirement that users have to register with the SeaWiFS Project as "Authorized Research Users." After they do that, the Ocean Color Data Support Team provides a password that allows access to the entire archive of SeaWiFS data. A serendipitous result of this process is that we've been able to keep track of everyone that has signed up to get SeaWiFS data or to use it in a multidisciplinary research project. So it shouldn't be too much of a surprise to be informed that there are SeaWiFS Authorized Research Users in 71 different countries. The Authorized User List has researchers in Malaysia, Oman, Botswana, Bulgaria, Croatia, Cote d'Ivoire, Ecuador, Madagascar, Lebanon, Malta, Mauritius, Mozambique, New Caledonia, Peru, Sri Lanka, Trinidad and Tobago, and Uruguay. The "top ten" in terms of the number of research users (other than the United States) are the United Kingdom, Japan, France, Germany, Italy, Spain, Canada, Australia, Russia, and the People's Republic of China.

And they get all the data they want, free of charge!

So as I noted, there was a lot riding on that launch on August 1, 1997. I'm glad I didn't watch it. And I'm glad that I've been privileged to be a small part of a remarkable instrument and mission called SeaWiFS ever since. Not many missions have done so much for so little. The SeaWiFS Project is a standard of excellence that should be recognized worldwide. As the next generation of gold-standard instruments is launched, and as they have provided striking images and exemplary data, it might be possible to forget that SeaWiFS has already done so much—and is still doing it, very reliably, providing useful data for researchers in so many places around the world, researchers in academic institutions, government agencies, and private corporations. The graph above shows the rise in registered SeaWiFS data users since launch. They now number about 2000 and are increasing steadily.



Aristotle said "Excellence is an art won by training and habituation. We do not act rightly because we have virtue or excellence, but we rather have those because we have acted rightly. We are what we repeatedly do. Excellence, then, is not an act but a habit." Unfortunately, when excellence is a habit, as it has been with the SeaWiFS Project, it might be possible to overlook such a record of accomplishment. On the occasion of the fifth anniversary of SeaWiFS in orbit, we should look back with respect and look toward the future with wisdom.

GES DAAC News

New Data Products

General News

People in the News

NEW DATA PRODUCTS & SERVICES

Detailed information about the archived data holdings at the GES DISC can be found at

http://daac.gsfc.nasa.gov

In this section we just emphasize important new happenings concerning our data holdings. These are arranged by data categories.

NEW TOOLS FOR GES DAAC DATA USERS

DATA POOL OPERATIONAL

The Data Pool at the GES DAAC has been installed, integrated, populated, and made operational. At present the Data Pool can hold 55 TB of data. This noteworthy event will provide easy direct route for a broader community to access the most recent data. Most data will reside in the pool only for limited periods (weeks up to a year) depending on data type. However, MODIS Level 1B calibrated geolocated radiance browse images will stay in the Data Pool to make browsing (before ordering) convenient. This is particularly true when customers use the GES DAAC online ordering system, WHOM. Currently, the Data Pool is being populated by subscription, chiefly with MODIS data products, as ingested data are being processed. MODIS Level 1B radiances, Geolocation, Cloudmask, and Atmospheric Profiles data, plus higher level MODIS science products from MODAPS are available. Aqua MODIS and AIRS data products will flow into the Data Pool as they are released to the public by the respective science teams. First the teams will carefully review each product for errors or defects. The MODIS Aqua radiances and geolocations may be released to the public fairly soon. The GES DAAC Data Pool is accessible from the GES DAAC WHOM online ordering system and through anonymous FTP. As of this date, the URL to use for pulling data from the Data Pool is

ftp://g0dps01u.ecs.nasa.gov/

The URL may change in the near future, so if the one given above doesn't work, send eMail to MODIS User Services at daac_usg@gsfcsrvr4.gsfcmo.ecs.nasa.gov or call 301-614-5304.

DATA SET NEWS

ATMOSPHERIC DYNAMICS

3-dimensional dynamic and thermodynamic state of the Earth-atmosphere system, from satellite measurements and assimilation systems

An improved AIRS Data Support Web site has been made public at

http://daac.gsfc.nasa.gov/atmodyn/airs/

It contains information and sample data related to the AIRS/AMSU/HSB suite of instruments on Aqua, which was launched on May 4, 2002. The sample data can be conveniently accessed using the "granule locator map" found at

http://daac.gsfc.nasa.gov/atmodyn/airs/map.html

MODIS DATA SUPPORT

Radiance data and auxiliary information such as geolocation & cloud mask, atmospheric profiles, and higher level ocean color data

Several of the most timely MODIS data products are now available electronically from the GES DAAC Data Pool via the online order system, WHOM, and FTP pull; see the previous item on the Data Pool.

MODIS Level 1b Reduced Volume Data—Subsampled by every fifth pixel of every fifth scanline in the standard 1 km product, for an effective 5 km horizontal resolution, these data provide global and regional coverage at 1/25 the distribution load, greatly enhancing the usability of MODIS data for a great many potential users. Two output formats are available, HDF-EOS and IEEE binary. These products are currently being staged to the Data Pool mentioned above.

MODIS Multiple Data Ordering Tool—The MODIS Data Support Team at the Goddard DAAC is pleased to announce the availability of the new MODIS Multiple Data Ordering portal. The purpose of this new data ordering page is to give MODIS users a much needed interface to easily search and order more than one data type simultaneously. Further, links to useful tools and documentation necessary to figure out the product, the satellite ground track, and the cloud cover are all brought together. Thus, the task of finding the right products, the satellite location and time over your area of interest, and the cloud free scene (or the opposite) can be accomplished from this one portal only. The new ordering page serves as a convenient interface to the WHOM ordering engine and is slated to replace the "No Frills" data access. For now, only MODIS–Terra swath products from the Goddard DAAC (L1, Atmosphere and Ocean L2) are covered, but work is underway to include the MODIS–Terra Ocean Level 3. You are welcome to try the new MODIS Multiple Data Ordering portal and let us know of any problems

that you may encounter. From the URL below, please use the image button *MODIS Multiple Data Ordering.*

http://daac.gsfc.nasa.gov/MODIS/data_access.shtml

OCEAN COLOR

Remote sensing ocean color data used to investigate ocean productivity, marine optical properties, and the interaction of winds and currents with ocean biology.

SeaWiFS Full Mission Data Set 4th Reprocessing—The fourth reprocessing of the full SeaWiFS mission data set was received by the GES DAAC from July 23 to August 26 (though the SeaWiFS Project can now reprocess the entire mission data set in approximately 1 week). The summary of the changes that are in this reprocessed data set can be found at

http://seawifs.gsfc.nasa.gov/SEAWIFS/RECAL/Repro4/

Note that Level 3 data files can be obtained by FTP from the SeaWiFS Project (instructions are on their Home Page), and the files in their FTP directories include seasonal binned and SMI products that are not archived at the DAAC.

For information about the SeaWiFS project and its data see *Background Information* at

http://seawifs.gsfc.nasa.gov/SEAWIFS/BACKGROUND/

Gleanings From the MODIS Science Team Meeting—As we consolidate the functions at the GES DAAC that support NASA ocean color data products, we also get to find out more information from the MODIS Ocean Team on the status of their data products. At the July MODIS Science Team meeting, members reported on the status of both data processing and data products. As noted earlier, MODIS Ocean data reprocessing is underway, and because of the remarkable efforts of the calibration team (headed by Dr. Robert Evans at the University of Miami) much of the variability in the data has been eliminated. One of the main reasons for this improvement is the use of data from the Marine Optical Buoy (MOBY), which is mentioned in the SeaWiFS article in this issue.

Science team members reported progress in the development of their particular data products. Notable among these reports was Mark Abbott's discussion of the use of the chlorophyll fluorescence band data to improve chlorophyll concentration data in coastal regions, Ken Carder's report on MODIS semianalytic ocean color algorithms, and Barney Balch's "bloom-in-progress" report on the coccolithophore calcite concentration algorithm. To see all the reports, go to

http://modis.gsfc.nasa.gov/sci_team/meetings/200207/pres_jul2002tue.html

Did You Know? SeaWiFS Subscription Features—Both the MODIS and Ocean Color data support teams provide users the capability of subscribing to specific data products. We just wanted to remind everyone that the SeaWiFS subscription system allows specification of file type and geographical location. That means that a researcher could go on a cruise in the southwest Pacific and ask the SIMBIOS Project to target successive cruise positions for Recorded LAC coverage. By providing the geographic coordinates of the research area, the subscription service would acquire all of the Recorded LAC data files acquired over that area. By the time the researcher is home, the subscription directory would have all the files acquired by SeaWiFS for the cruise. It also works for HRPT station and GAC data files.

SeaWiFS Authorized Users Near 2000—At last count, we have registered 1,987 SeaWiFS Authorized Research Users since the beginning of the mission. Traditionally we get a surge in registrations at the beginning of the academic calendar year in the U.S., so we expect to see SeaWiFS Authorized Research User 2000 in September!

PAR For The Course; New Search Engine—Also in September, we expect to add binned SeaWIFS Photosynthetically Active Radiation Products to our data archive, in addition to the SMI PAR products archived in our "Evaluation Products" section. The PAR products will be moved from that section to a place of honor in their own PAR section. Also, when the transfer of reprocessed data is complete, we'll then work on installing our much anticipated attribute search engine, which allows users to search on the percentage of cloud cover over the ocean and the total ocean area in a SeaWiFS HRPT station data file. Denis Nadeau described this search engine in a poster presentation at the Veridian Seventh International Conference on Remote Sensing for Marine and Coastal Environments, held in Miami this past May. (Warning in advance: the cloud cover statistics may surprise you. There are a lot of clouds up there, even on a "clear" day.)

LAND BIOSPHERE

Long time-series vegetation and thermal infrared brightness temperature data sets for global change research.

We have received 4.5 years of the SeaWiFS vegetation indexes developed by Jim Tucker's group (GIMMS Code 923) and processed by the SeaWiFS data processing system (part of Code 902). These include the simple vegetation index (VI), the Normalized Difference Vegetation Index (NDVI), and the Enhanced Vegetation Index (EVI), as well as the channels 2 (blue), 4 (blue-green), 6 (red), 8 (near IR) reflectances. Horizontal resolution is 4.6 km to match the MODIS gridded product, and temporal resolution is 16 days. Data are mapped to a sinusoidal projection and have been separated by continent. Any users wishing to access these data will still require SeaWIFS authorization, the procedures of which can be reviewed at

http://seawifs.gsfc.nasa.gov/SEAWIFS/LICENSE/checklist.html

However, all SeaWiFS-derived products (both ocean and land) will become public domain at the end of December 2002.

Researchers may also find useful products in our other important data set collections.

ATMOSPHERIC CHEMISTRY

Ozone and other trace gas compositions, dynamics and energy interactions of the upper atmosphere.

FIELD EXPERIMENTS

Aircraft and ground based measurements of meteorological variables designed to improve science algorithms and validate satellite-derived data products.

HYDROLOGY

Global precipitation, its variability, and associated latent heating, important modeling and applications.

INTERDISCIPLINARY

Global land, ocean and atmospheric parameters mapped to uniform spatial and temporal scales for basic research and applications studies.

For more details about the GES DISC data holdings and to order data see our Home Page or contact us by eMail, phone, or fax.

http://daac.gsfc.nasa.gov/

For MODIS User Services
eMail: daac_usg@gsfcsrvr4.gsfcmo.ecs.nasa.gov
phone: 301–614–5473
fax: 301–614–5304
For other products' User Services
eMail: daacuso@daac.gsfc.nasa.gov
phone: 301–614–5224 or 1–877–422–1222
fax: 301–614–5304

GENERAL NEWS

First Light Events MODIS

Aqua first light data were taken June 24, 2002, when the instrument's nadir door opened for its first look at Planet Earth. The data were ingested at the GES DAAC, processed into first light images, and proudly presented by the MODIS Team Leader and associates at the IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2002 meeting in Toronto, June 24–28. This very significant event, providing magnificent images, was the ultimate metric for demonstrating the precision of the instrument, the effortless stability of the NASA Earth Observing System Data and Information System (EOSDIS), and the rapidity of delivering MODIS data to MODAPS (the MODIS upper level science data processing system) and, in turn, to the interested community.

Aqua AIRS/AMSU/HSB first light images were taken on June 14th.

Preparing for the Solar Radiation and Climate Experiment (SORCE)

James Johnson, the GES DAAC Atmospheric Chemistry Data Support Team Lead, met with Chris Pankratz, Operations Software Manager for SORCE. SORCE is a NASA sponsored project that will provide solar total irradiance measurements and the full spectral irradiance measurements required by climate studies. It is presently scheduled to launch in the November–December 2002 time frame. This forward looking information exchange is part of the initial phase of ensuring that the GES DAAC is prepared and able to service SORCE mission data and users. Developing a good working relationship with the SORCE team also facilitates this support.

An Outreach Opportunity

This spring GES DAAC personnel enjoyed the company of 15 young minds as they were given a presentation about EOSDIS on "Take Your Daughter to Work Day."

Ingest of SeaWiFS Reprocessing #4

This effort was sped up significantly by hard work and a new procedure. Congratulations to the Ocean Color Data Support Team (OCDST).

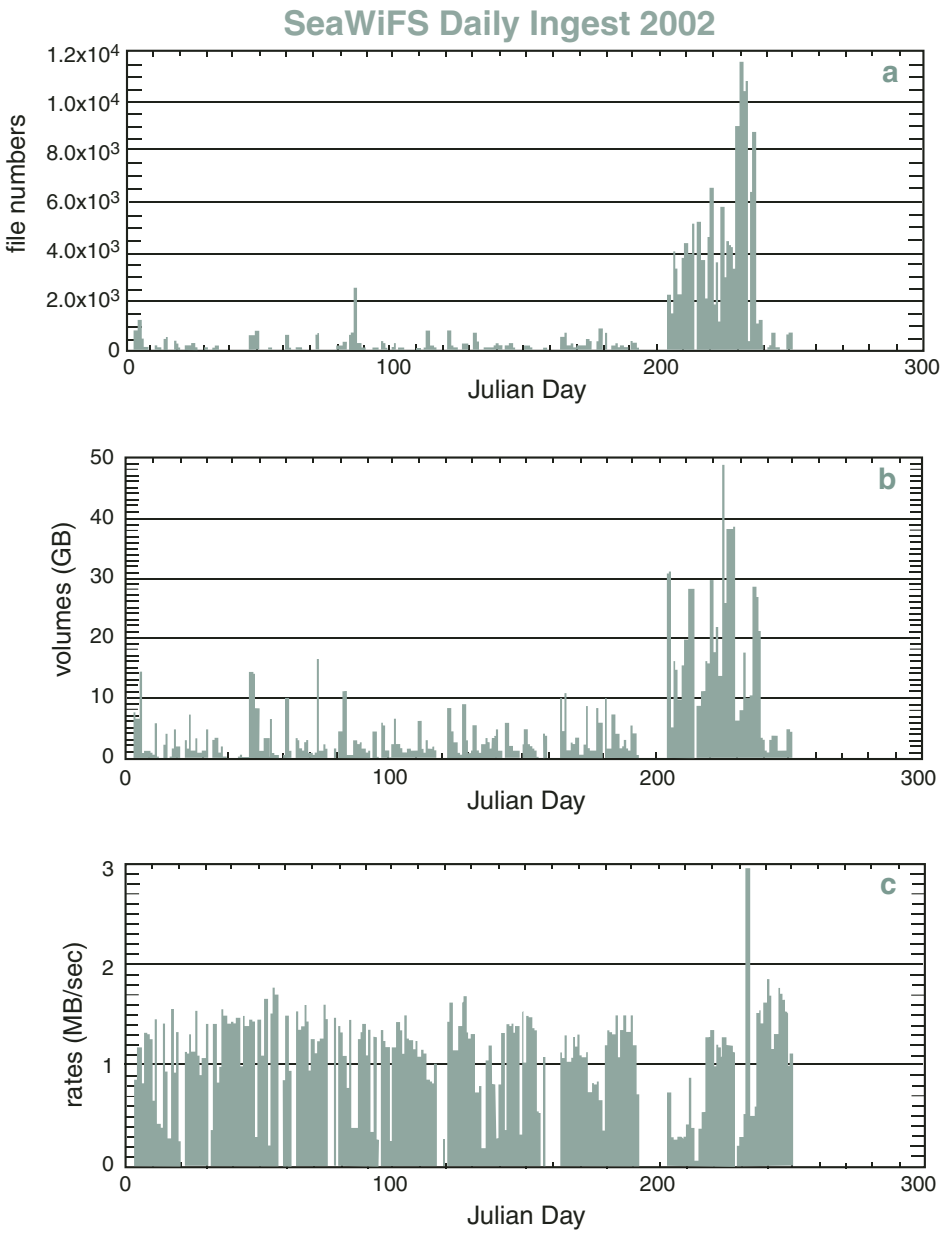
The ingest process for SeaWiFS reprocessed version 4 data began July 23 and was essentially complete August 26. For this work, data transfer and ingest jobs were not stopped or reduced in volume during weekends. The period saw 156,097 files archived—approximately 690 GB. The average daily archive volume approximated 20 GB (4678 files). This matches the maximum ingest and archive volume achieved during the transfer of reprocessed Version 3 data. The maximum volume ingested was 56.56 GB on August 12, and the maximum number of ingested files was 11,706 on August 19. The plots to the right (on page 9) show year 2002 plots of the daily averages for (a) the number of ingested files, (b) the volume in Gigabytes, and (c) rates in Megabytes per second.

Additional graphs of daily transfer, ingest, and archive statistics in the form of PNG plots are displayed at

http://eosdata.gsfc.nasa.gov/data/dataset/SEAWIFS/ingest_stat/

The primary difference for this ingest and archive of SeaWiFS reprocessed data was the implementation of the multistream ingest and archive function in the DAAC Version 0 (V0) data system. Two streams were activated at the beginning of the reprocessed data transfer, and four streams were activated soon after. This capability means that four ingest or archive jobs could be run simultaneously. Automatic jobs were created for splitting data from single transfer streams to the multiple stream ingest system. The multistream ingest function greatly increased the ingest and archive speed.

And let us also note that Suhung Shen and John Wilding monitored the data ingest and archive process from home on weekends through the entire month of August. They did a great job!



FYI: National Geographic Likes (and Links) CZCS Classic Scenes: James Acker Reports for the Ocean Color Data Support Team

We just found out that the National Geographic Web site "Oceans of Plenty: South Africa's Teeming Seas" at

http://magma.nationalgeographic.com/ngm/0208/feature2/index.html

featured *CZCS Classic Scenes* as a "Related Link." The funny thing about that page is that it displays what is probably a misidentified eruption of hydrogen sulfide gas, as described in our *Science Focus!* article "A Bloom By Any Other Name...Might Never Be a Bloom At All."

http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/OCDST/sulfur_plume.html

We have written a letter to the editor to help clear this up.

Meetings, Publications, and Presentations

The GES DISC benefits from attending a variety of meetings by reaching potential users, getting feedback from current users on what things we do very well and where we could improve our services to our customers, keeping up to date on data systems technology, and more.

The GES DAAC demonstrated its ESDIS funded Near Archive Data Mining (NADM) environment to MODIS data providers and users. Scientists interested in searching extensive satellite data sets (e.g., MODIS and TRMM) for specific events (surface fires, volcanic eruptions, and numerous other phenomena) can supply the GES DISC with specific mining (search) algorithms that are then run at the GES DISC. Depending on the phenomena searched for and the search algorithm, the amount of mined data shipped to the cooperating scientist is just a fraction of that otherwise required by the investigator. The demonstration proved successful in meeting the team's objective to arrange the acquisition of scientist developed data reduction algorithms to be inserted into the NADM environment.

A.K. Sharma and **Sunmi Cho** of the Atmospheric Dynamics Data Support Team attended the Atmospheric Infrared Sounder (AIRS) science meeting held May 1–4 in Solvang, CA. Their presentation on the GES DISC DAAC AIRS data support Home Page and the GES DISC DAAC search and order interface was given to the AIRS Science Team members.

GES DAAC personnel attended the June 17–19 Strategic Evolution of ESE (Earth Science Enterprise) Data Systems (SEEDS) workshop in San Diego, CA, where Steve Kempler presented the Active Archive perspective on the life cycle of science data. The focus of the workshop was on developing community based processes to guide the development and validation of SEEDS protocols and standards, cost models, interfaces, technology, and accountability.

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New Publication—J.G. Acker (NASA Goddard Earth Sciences DAAC), C.W. Brown (NOAA NESDIS), A.C. Hine (University of South Florida), E. Armstrong (JPL Physical Oceanography DAAC), and N. Kuring (NASA SeaWiFS Project), 2002: "Satellite remote sensing observations and aerial photography of storm-induced neritic carbonate transport from shallow carbonate platforms," *International Journal of Remote Sensing,* 23:14: 2853–2868.

GES DISC personnel participated in nine papers presented at the American Geophysical Union (AGU) 2002 Spring Meeting, Washington Convention Center, May 28–30 (Tuesday–Friday) in Washington, DC.

1. "MODIS Radiances for Earth System Science Studies," by Suraiya P. Ahmad, V.V. Salomonson, W.L. Barnes, X. Xiong, G.G. Leptoukh, G.N. Serafino; paper A21A-09.
2. "AIRS Data Support at NASA Goddard Earth Science DISC DAAC," by Sunmi Cho, J. Qin, and A. Sharma; paper A22B-09.
3. "TOMS Data Products at the NASA Goddard Earth Sciences DAAC," by Suraiya P. Ahmad, J.E. Johnson, G.N. Serafino, R.D. McPeters; paper A22B-10.
4. "GES DAAC Improved Tools for Accessing MODIS Data," by D. Ouzounov, S. Ahmad, P. Eaton, J. Koziana, G. Leptoukh, A. Savtchenko, G. Serafino, A. Sharma, M. Sidker, B. Zhou; paper A22B-07.
5. "CLAMS 2001 Data Available From the Goddard Distributed Active Archive Center," by James V. Koziana, A. Savtchenko, A. Sharma, G. Serafino; paper A31A-11.
6. "TRMM Rainfall Data for Ecosystem Studies and Applications in Arid and Semiarid Regions," by Z. Liu, L. Chiu, H. Rui, W. Teng, G. Serafino; paper B32B-04.
7. "TRMM Data Mining Service at the GES DAAC," by Hualan Rui, B. Teng, G. Serafino, L. Chiu, R. Mack, J. McManus; paper H22A-31.
8. "Midinfrared Luminescence Observed During Rock Deformation," by F.T. Freund, M. Jhabvala, A. La, P. Shu, S. Tsay, D. Ouzounov, Y. Fei; paper T22B-03.
9. "Satellite and Ground Tracking of Pre-Earthquake Electromagnetic Activity," by D.P. Ouzounov, F.T. Freund, P.T. Taylor, paper T22B-04.

At the IEEE International Geoscience and Remote Sensing Symposium (IGARSS'02), Toronto, June 24–28, the GES DAAC ran a booth staffed by S. Ahmad, S. Kempler, G. Leptoukh, J. Qu, and presented 3 posters and 1 oral session by V. Salomonson, as follows:

1. "Highlights of MODIS Products," by Suraiya Ahmad, Dimitar Ouzounov, Gregory Leptoukh, George Serafino, and Steven Kempler.
2. "GES DAAC Tools for Accessing and Visualizing MODIS Data," by Gregory Leptoukh, Suraiya Ahmad, Peggy Eaton, Mahabaleshwara Hegde, Steven Kempler, James Koziana, Dana Ostrenga, Dimitar Ouzounov, Andrey Savtchenko, George Serafino, A.K. Sharma, and Bryan Zhou.
3. "Responding to the Challenge of Producing and Distributing MODIS Data at the NASA/GES DISC Via the Remote Sensing Information Partners (RSIP) Program," Jianhe (John) Qu, George Serafino, Bill Teng, Dimitar Ouzounov, Nathan Pollack, and Long Chiu.
4. "An Overview of the Earth Observing System MODIS Instrument and Associated Data Systems Performance," Vincent V. Salomonson, William Barnes, Jack Xiong, Steve Kempler, and Ed Masuoka.

The First TRMM International Conference was held July 21–26 in Honolulu. Bill Teng, Long Chiu, and Zhong Liu represented the GES DISC and made several presentations. Bill Teng reports that the conference provided a fine framework for us to reach and interact with a focused group of TRMM users and to gain insight from them as to desired changes to the preferred directions and priorities of TRMM data support services the GES DAAC provides. Many users told us of their satisfaction with the support we provide. On July 24 the DAAC (with NASDA and TSDIS) hosted a "TRMM Data and Access" session that was attend by 64 people. Long Chiu and Bill Teng chaired the session that included presentations by GES DAAC, TSDIS, and NASDA/EOC personnel. These included descriptions of the

- TRMM Overflight Finder
- TSDIS Orbit Viewer: A Visualization Tool for TRMM Data
- TRMM Data and Access, including special access tools.

DAAC representatives also presented four poster papers.

1. "Comparing TRMM and Gauge Rain Rates Over New Mexico," by L. Chiu, Z. Liu, J. Vongsaard, S. Morain, A. Budge, P. Neville, and C. Bales.
2. "Data and Software Support for TRMM Field Experiments," by Zhong Liu, P. Hrubiak, L. Chiu, H. Rui, W. Teng, and G. Serafino.
3. "Data Mining for Facilitating the Access and Use of TRMM Data at the GES DAAC," by Hualan Rui, Bill Teng, Robert Mack, George Serafino, Long Chiu, and Jim McManus.
4. "TRMM Rainfall Data for Human Health and Environment Applications," by Zhong Liu, L. Chiu, H. Rui, W. Teng, G. Serafino.

Three Colleagues and Friends Leave the GES DAAC — Best of Luck to Them All

Goodbye and best of luck to **Bob Rank** who has left the GES DAAC after many years of onbase service (8 years at the DAAC and 20 years at NASA, total). He will be assuming the role of "Deputy Program Manager" at NOAA for the Satellite Active Archive (SAA). He was the main person in the Operations group working on the AVHRR Pathfinder all these years, dating back to around 1994. Recently he's been involved in researching operations scenarios in preparation for the NPP (NPOESS Preparatory Project) mission. Later in this decade NOAA is planning to start launching an improved National Polar-Orbiting Operational Environmental Satellite System (NPOESS). The NPP mission will help establish both the satellite instrument complement and the necessary ground processing system for this program.

Jim Koziana, formerly employed by L3 and MODIS Data Support Team (MDST) Lead at the GES DAAC, has unfortunately left us for slightly warmer lands. Jim has been at the GES DAAC for several years and gained an excellent reputation for his hard work with the MODIS Science Team and his fellow workers. Jim will be sorely missed, but GES DAAC's great loss will be the NASA Langley Research Center (LaRC) DAAC's great gain. We wish Jim all the best back home and at LaRC. One thing is for sure: he'll enjoy his 7-acre ranch and the lack of DC traffic.

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Congratulations and best wishes to **George Serafino,** longtime head of the GES DISC Customer Services group. George has accepted a branch head position at NOAA/NESDIS. He will head up the Satellite Analysis Branch (SAB) of the Satellite Services Division (SSD), located in the World Weather Building in Camp Springs. MD. We will all miss George, who has been a longtime mainstay of the Goddard DAAC. He was with Goddard Space Flight Center for 20 years; the first 9 as a contractor (6 years with Applied Research Corporation and 3 years with STX Corporation). He then became a Civil Servant working on the early planning for the DAAC in July 1991, first as Science Support Lead, then as Data Manager and Customer Service Lead (his recent titles). His last day at the DAAC was August 9.

George maintaining focus in the whirlwind action of the GES DAAC

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